MTU BIO-ATHLON HINTS 2011

Note: The field identification will be outside and will be held rain or sunshine. Please make sure your students are prepared to go outdoors for up to an hour at any point during the day.

Note: We will provide non-latex gloves but students will come in contact with preserved organisms containing trace amounts of formalin and phenol. Also, the veins and/or arteries may be injected with latex. Please check with your students about possible allergies.

I. Dissection

This activity will be the dissection of a preserved vertebrate animal with the identification of organs required. Students will not have access to dissection guides and will have to base their identifications on memory from their high school dissection experience and on the relationships of unknown organs to those that are known. Dissection tools, safety goggles and gloves will be provided but participants should wear old clothing and/or bring a laboratory apron or coat. Grading will be based primarily on the correctness of the identification but points will also be awarded for the quality of the dissection.

II. Field Identification

This activity will involve a search for some common organisms or their parts during a brief field trip. This search will require general knowledge of biological materials including familiarity with both plants and animals and with their obvious external structures.

III. Case Studies in Clinical Laboratory Science

Students should:

1. know the parts of, and how to correctly operate, move and carry, a compound microscope.

2. know the reference ranges (normal values) for human:
   - white blood cell (WBC) count
   - red blood cell (RBC) count
   - platelet count
   - blood urea nitrogen (BUN)
   - creatinine

3. understand the procedure for how to perform:
   a Gram stain
   catalase and oxidase tests on bacteria
   ABO grouping and Rh typing
   antibiotic sensitivity testing
   a routine urinalysis

4. study the symptoms and basic clinical tests associated with the following.
   diabetes
   Candida albicans
   urinary tract infection
   glomerulonephritis
   chronic anemia due to blood loss
   Clostridium difficile
   Giardia lamblia
   Entamoeba histolytica
   diverticulosis
   MRSA
   streptococcal infections
   heavy metal poisoning
   Enterococcus

IV. Size Exclusion Chromatography

In this laboratory activity you will use a method called size exclusion chromatography to separate and identify two different biomolecules. Chromatography is a widely used method of separation that is used to analyze complex mixtures of molecules. There are many different kinds of chromatography; in this activity we will focus on size exclusion chromatography. This method uses porous beads to separate out particles by size. Large particles will pass around the beads and flow through faster, small particles will flow through the beads and the resistance will slow them down. We will use a kit designed by Bio-Rad (a biotechnology company) to separate a mixture of hemoglobin and vitamin B_{12}. Afterwards you will be asked questions about the two molecules as well as the method used to separate them.